佛山市国星光电股份有限公司
FOSHAN NATIONSTAR OPTOELECTRONICS CO., LTD

SPECIFICATION

Customer		Product	TOP LED
Customer No.		Type	FM-3528WNS-460T

APPROVED SIGNATURES			

ISO14001
环境管理
体系认证

ISO9001
质量管理
体系认证

Add：NO.18 South Huabao Rd,Foshan,Guangdong,China
Tel：0086-0757-82109310，82100231
Fax：0086-0757-82100200
Zip：528000
http://www.nationstar.com

Research & Development Center		
APPROVE	CHECK	DRAW
Version NO：A3		
Release Date: 2011-05-04		

FM-3528WNS-460T Top Light Emitting Diode

Technical Data Sheet

This product is generally used as indicator and luminary for electronic equipment.

And it also be widely used for indoor and outdoor decorative lighting.

Features:

- Material: InGaN
- Encapsulation: Colored Diffused silicone
- Emitting Color: Natural White
- Reflow Solderable
- High Luminous Intensity and Low Power Dissipation
- Good Reliability and Long Life
- Complied With ROHS Directive

Catalogue

Electrical Characteristics

✧ Absolute Maximum Ratings (Temperature=25 ℃):

Parameter	Symbol	Rating	Unit
Forward Current	I_F	25	mA
Pulse Forward Current*	I_{FP}	100	mA
Reverse Voltage	V_R	5	V
Operating Temperature	T_{OPR}	-30 ~ +85	℃
Storage Temperature	Tstg	-40 ~ +100	℃
Power Dissipation	P_D	90	Mw
Electrostatic Discharge Threshold (HBM)		1000	V

* Note: Pulse width≤0.1ms, Duty≤1/10*

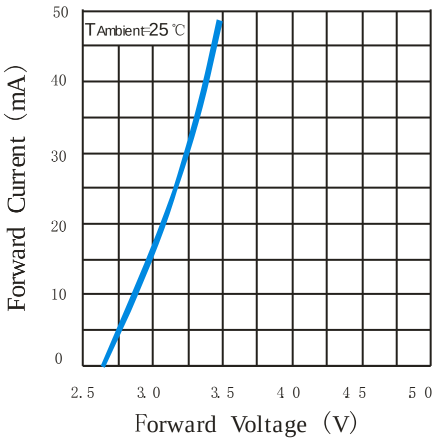
✧ Electro-Optical Characteristics (Temperature=25 ℃):

Parameter		Symbol	Condition	Min.	Typ.	Max.	Unit
Reverse Current		I_R	V_R=5V			50	μA
Forward Voltage		V_F	I_F=20mA	2.8	3.2	3.6	V
Chromaticity Coordinates	X				0.33		
	Y				0.34		
Color Temperature		Tc			5600		K
Color Rendering Index		Ra		70			
Luminous Intensity*		I_V			3000		mcd
View Angle		$2\theta_{1/2}$			110		deg.

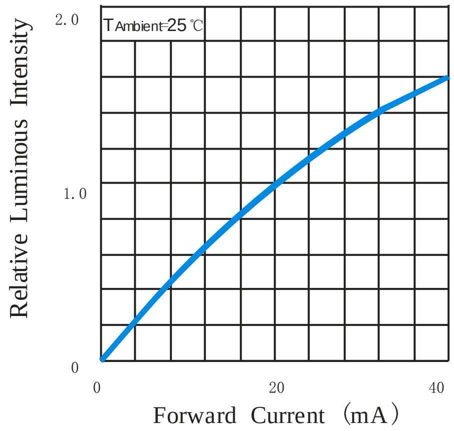
Note: Luminous intensity is measured with a light sensor and filter combination that approximates the CIE eye-response curve.

Typical Characteristics Curves

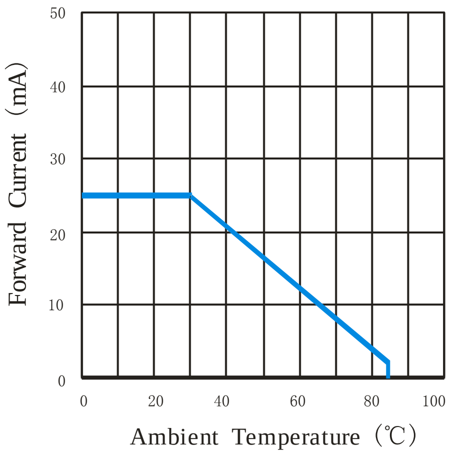
Volt-Ampere Characteristics



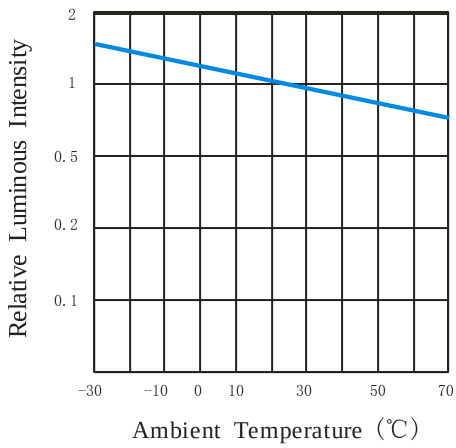
Relative Luminous Intensity VS Forward Current



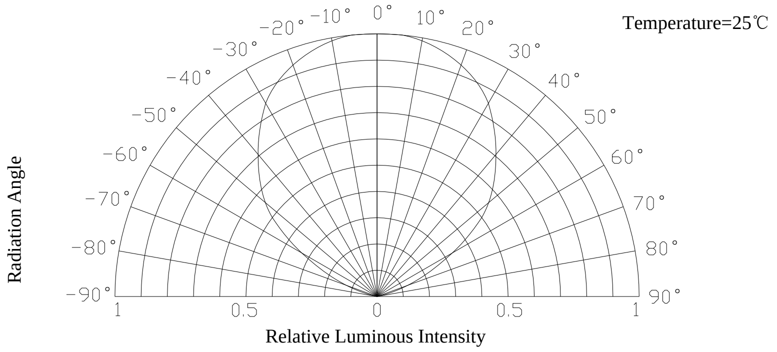
Forward Current Derating Curve



Luminous Intensity VS Ambient Temperature



Radiation Diagram



Reliability Test Items And Conditions

ESD-damaged LEDs will exhibit abnormal characteristics such as high reverse leakage current,low forward voltage, or “no lightup” at low current.

To verify for ESD damage, check for “lightup” and V_F of the suspect LEDs at low currents.

The V_F of “good” LEDs should be > 2.0V@0.1mA for InGaN product and >1.4V@0.1mA for AlInGaP product.

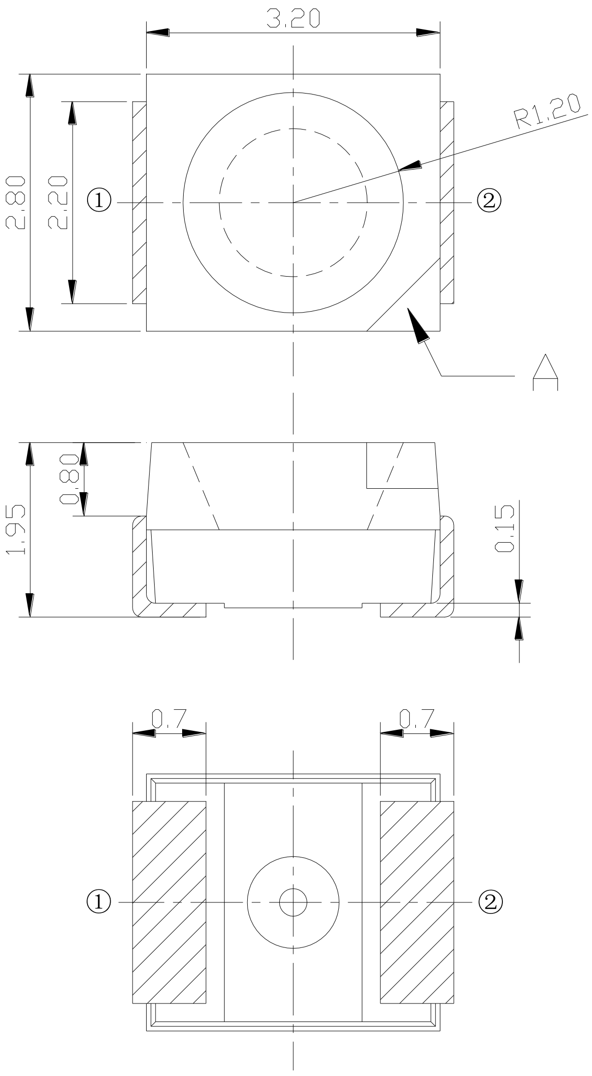
Test Items	Reference Standard	Test Conditions	Quantity	Judging Criteria
Solderability	GB/T 4937，Ⅱ,2.1	Solder Temperature：300℃ Solder Duration：（3.5±0.5）sec.	15	Solderable Area Over 95%
Thermal Shock Followed by High Temperature And High Humidity Cyclic	GB/T 4937，Ⅲ,1.1 GB/T 4937，Ⅲ.4	-40℃ → 10 min. 5 Cycles ↓↑ Shift (2~3) min. 100℃ → 10 min. ↓ 25℃~55℃ （90%~95%）RH 2 Cycles for 48 hrs. Recover for 2 hrs.	11	C=0 & I**
Resistance For Soldering Heat	GB/T 4937，Ⅱ,2.2 GB/T 4937，Ⅱ,2.3	Reflow Soldering	15	C=0 & I**
DC Operating Life	GB/T 4938, 2.2.1	1000 hrs. Forward Current：25mA	22	C=0 & I*
High Temperature Storage	GB/T 4937，Ⅲ.2	100℃→1000 hrs.	15	C=0 & I*
High Temperature And High Humidity Cyclic	GB/T 4937，Ⅲ.4	25℃~55℃ （90%~95%）RH 6 Cycles for 144 hrs. Recover for 2 hrs.	11	C=0 & I*

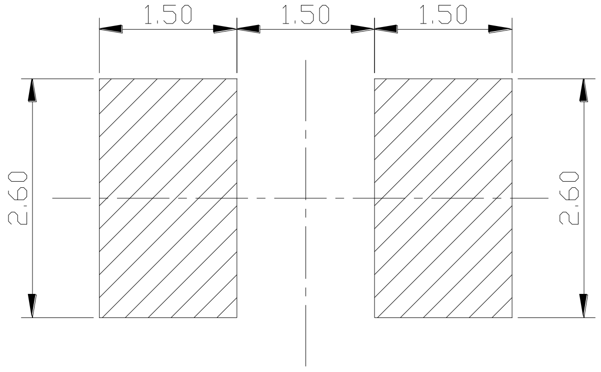
Criteria For Judging Damage

Items	Symbol	Test Conditions	Criteria For Judging Damage I*	Criteria For Judging Damage I**
Forward Voltage	V_F	I_F=20mA	⩾USL×1.2	⩾USL
Reverse Current	I_R	V_R=5V	⩾USL×2.0	⩾USL
Luminous Intensity	I_V	I_F=20mA	⩽LSL×0.5	⩽LSL

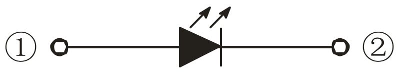
USL: Upper Standard Level, LSL: Lower Standard Level

Outline Dimensions





Recommended Soldering Pad



Polarity

Note:

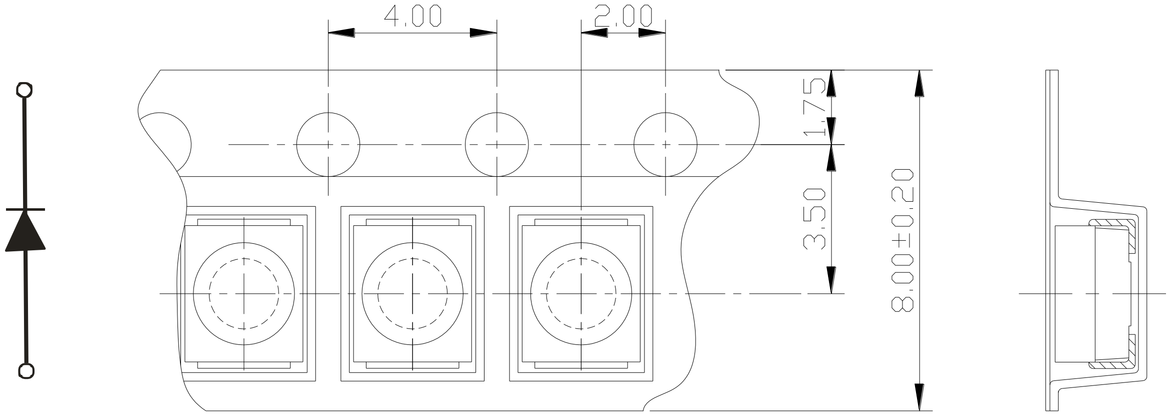
A：Nick Mark

All dimensions in mm.

Tolerances unless mentioned is ±0.1 mm.

Packaging (1)

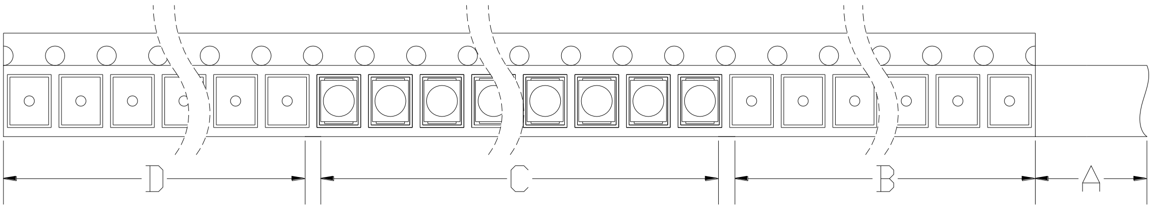
✧ Carrier Tape



All dimensions in mm, tolerances unless mentioned is ±0.1 mm.

✧ Details Of Carrier Tape

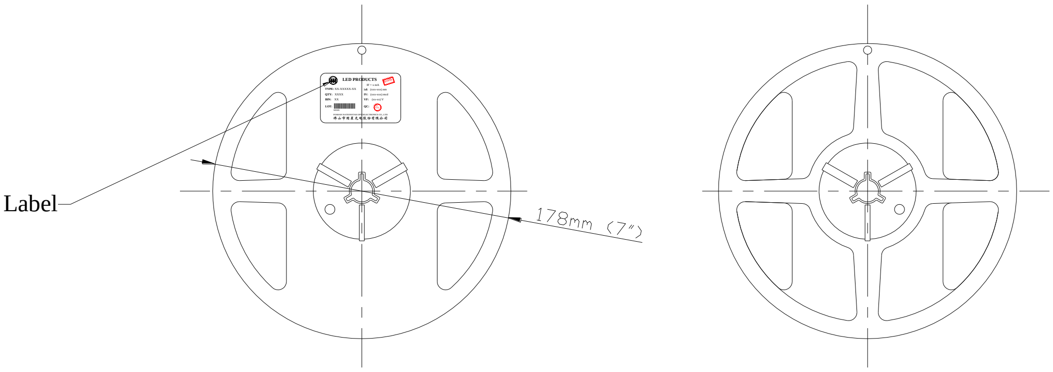
Progressive Direction →



A: Top Cover Tape, 300mm; B: Leader, Empty, 200mm; C:2000 Lamps Loaded; D: Trailer, Empty, 200mm.

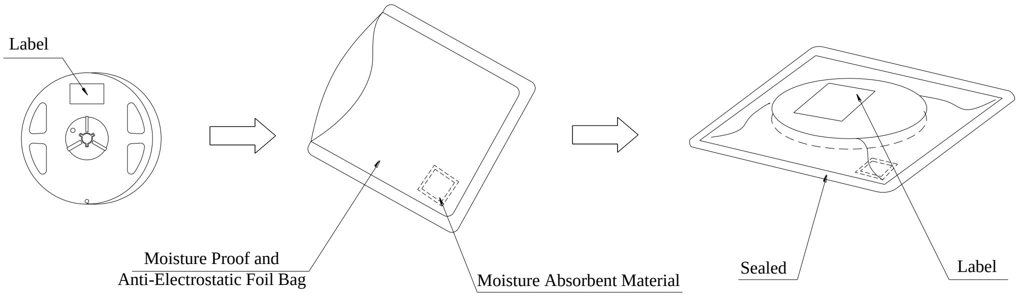
✧ Reel Dimension

Progressive Direction →

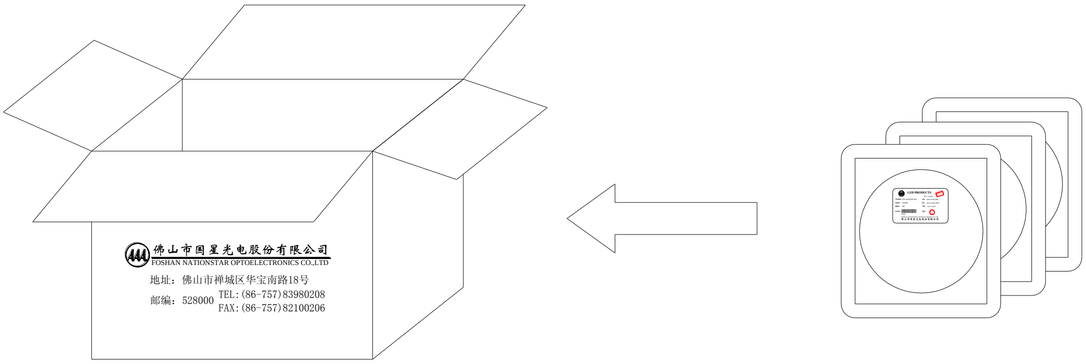


Packaging (2)

✧ Moisture Proof and Anti-Electrostatic Foil Bag

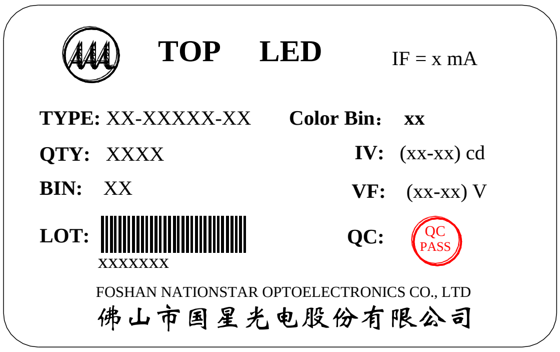


✧ Cardboard Box



✧ Label Explanation

QTY：Quantity
BIN：Rank
LOT：Lot Number
Color Bin：Chromaticity Coordinate
IV：Luminous Intensity Range
VF：Forward Voltage Range
IF：Testing Current



TOP LED IF = x mA

TYPE: XX-XXXXX-XX **Color Bin：** **xx**
QTY: XXXX **IV:** (xx-xx) cd
BIN: XX **VF:** (xx-xx) V
LOT: XXXXXXX **QC:** QC PASS

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Guideline for Soldering

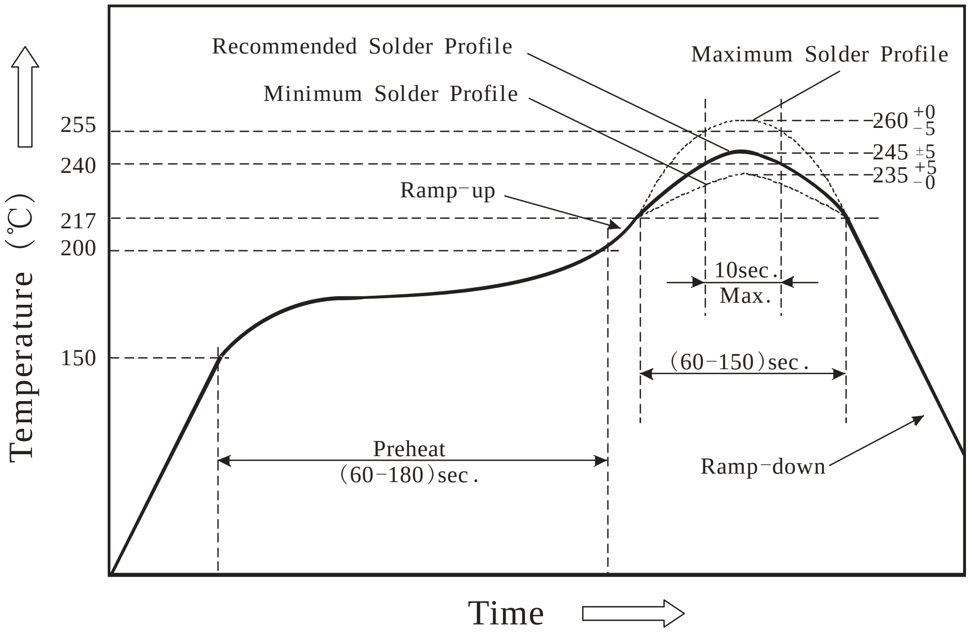
1. Hand Soldering

A soldering iron of less than 20W is recommended to be used in Hand Soldering. Please keep the temperature of the soldering iron under 360℃ while soldering. Each terminal of the LED is to go for less than 3 second and for one time only.

Be careful because the damage of the product is often started at the time of the hand soldering.

2. Reflow Soldering:

Use the conditions shown in the under Profile of Pb-Free Reflow Soldering.



- Reflow soldering should not be done more than two times.
- Stress on the LEDs should be avoided during heating in soldering process.
- After soldering, do not deal with the product before its temperature drop down to room temperature.

3. Cleaning

It is recommended that alcohol be used as a solvent for cleaning after soldering. Cleaning is to go under 30℃ for 3 minutes or 50℃ for 30 seconds. When using other solvents, it should be confirmed beforehand whether the solvents will dissolve the package and the resin or not.

Ultrasonic cleaning is also an effective way for cleaning. But the influence of Ultrasonic cleaning on LED depends on factors such as ultrasonic power. Generally, the ultrasonic power should not be higher than 300W. Before cleaning, a pre-test should be done to confirm whether any damage to LEDs will occur.

Note: This general guideline may not apply to all PCB designs and configurations of all soldering equipment. The technique in practice is influenced by many factors it should be specialized base on the PCB designs and configurations of the soldering equipment.

Precautions (1)

1. Storage

- Moisture proof and anti-electrostatic package with moisture absorbent material is used, to keep moisture to a minimum.
- Before opening the package, the product should be kept at 30℃ or less and humidity less than 60% RH, and be used within a year.
- After opening the package, the product should be stored at 30℃ or less and humidity less than 10%RH, and be soldered within 168 hours (7 days). It is recommended that the product be operated at the workshop condition of 30℃ or less and humidity less than 60%RH.
- If the moisture absorbent material has fade away or the LEDs have exceeded the storage time, baking treatment should be performed based on the following condition: (60±5)℃ for 24 hours.

2. Static Electricity

Static electricity or surge voltage damages the LEDs. Damaged LEDs will show some unusual characteristics such as the forward voltage becomes lower, or the LEDs do not light at the low current. even not light.

All devices, equipment and machinery must be properly grounded. At the same time, it is recommended that wrist bands or anti-electrostatic gloves, anti-electrostatic containers be used when dealing with the LEDs.

3. Vulcanization

LED curing is due to sulfur being in bracket and the +1 price of silver in the chemical reaction generated Ag2S in the process. It will lead to the capacity of reflecting of silver layer reducing , light color temperature drift and serious decline ,seriously affecting the performance of the product.So we should take corresponding measures to avioding vulcanization, such as to avoid using sulphur volatile substances and keeping away from high sulphur content of the material.\

4. Safety Advice For Human Eyes

Viewing direct to the light emitting center of the LEDs, especially those of great Luminous Intensity will cause great hazard to human eyes. Please be careful.

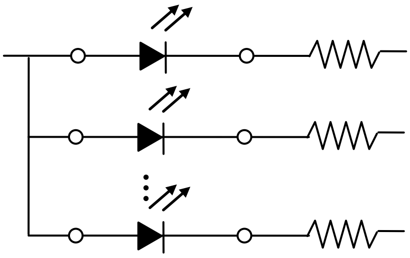
5. Design Consideration

In designing a circuit, the current through each LED must not exceed the absolute maximum rating specified for each LED. In the meanwhile, resistors for protection should be applied, otherwise slight voltage shift will cause big current change, burn out may happen.

It is recommended to use Circuit A which regulates the current flowing through each LED rather than Circuit B. When driving LEDs with a constant voltage in Circuit B, the current through the LEDs may vary due to the variation in Forward Voltage (V_F) of the LEDs. In the worst case, some LED may be subjected to stresses in excess of the Absolute Maximum Rating.

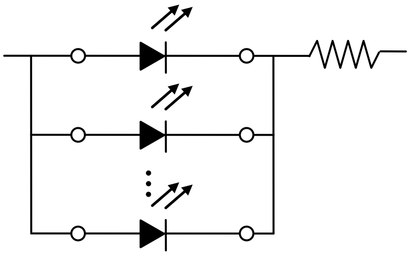
Precautions (2)

(A)



Preferable

(B)

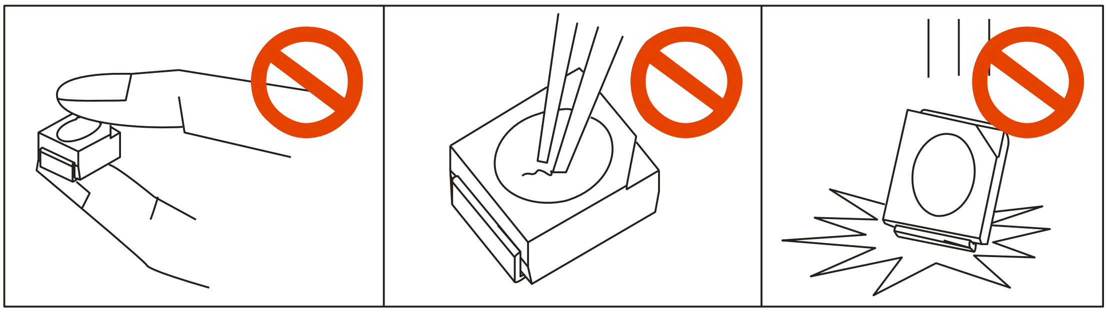


Non-Preferable

Thermal Design is paramount importance because heat generation may result in the Characteristics decline, such as brightness decreased, Color changed and so on. Please consider the heat generation of the LEDs when making the system design.

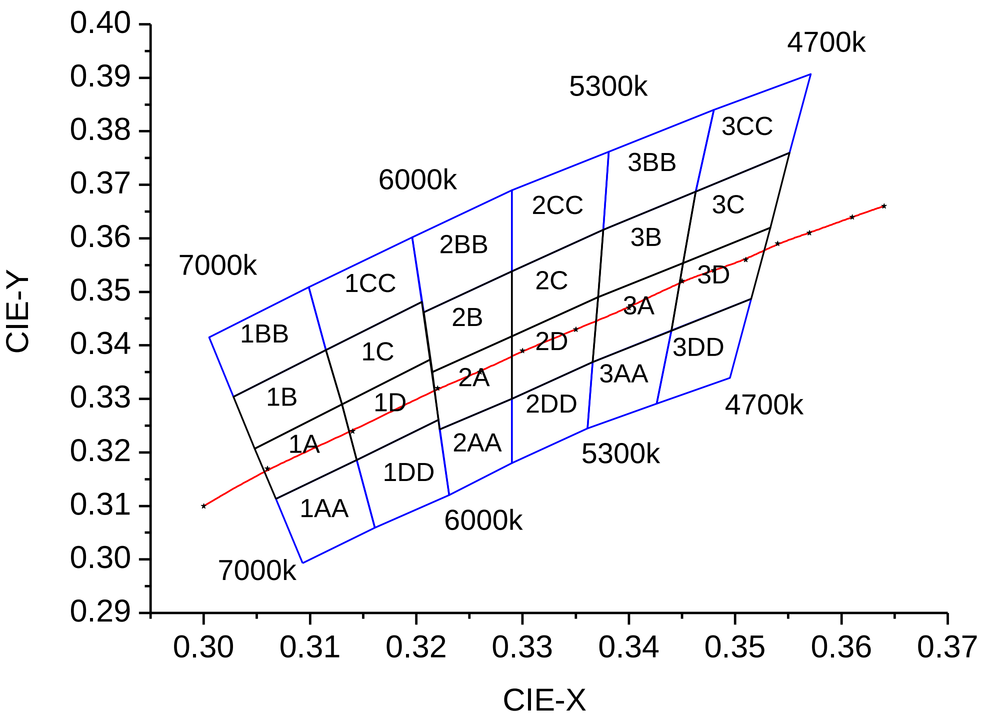
6. Others

When handling the product, touching the encapsulant with bare hands will not only contaminate its surface, but also affect on its optical characteristics. Excessive force to the encapsulant might result in catastrophic failure of the LEDs due to die breakage or wire deformation. For this reason, please do not put excessive stress on LEDs, especially when the LEDs are heated such as during Reflow Soldering.



The epoxy resin of encapsulant is fragile, so please avoid scratch or friction over the epoxy resin surface. While handling the product with tweezers, do not hold by the epoxy resin, be careful.

Appendix: Chromaticity Diagram



		Bottom	Left	Top	Right			Bottom	Left	Top	Right
1A 6850K	X	0.3068	0.3048	0.313	0.3144	**1B 6850K**	X	0.3048	0.3028	0.3115	0.313
	Y	0.3113	0.3207	0.329	0.3186		Y	0.3207	0.3304	0.3391	0.329
1C 6250K	X	0.313	0.3115	0.3205	0.3213	**1D 6250K**	X	0.3144	0.313	0.3213	0.3221
	Y	0.329	0.3391	0.3481	0.3373		Y	0.3186	0.329	0.3373	0.3261
2A 5800K	X	0.3222	0.3215	0.3290	0.3290	**2B 5800K**	X	0.3215	0.3207	0.3290	0.3290
	Y	0.3243	0.3350	0.3417	0.3300		Y	0.3350	0.3462	0.3538	0.3417
2C 5400K	X	0.3290	0.3290	0.3376	0.3371	**2D 5400K**	X	0.3290	0.3290	0.3371	0.3366
	Y	0.3417	0.3538	0.3616	0.3490		Y	0.3300	0.3417	0.3490	0.3369
3A 5200K	X	0.3366	0.3371	0.3451	0.3440	**3B 5200K**	X	0.3371	0.3376	0.3463	0.3451
	Y	0.3369	0.3490	0.3554	0.3427		Y	0.3490	0.3616	0.3687	0.3554
3C 4800K	X	0.3451	0.3463	0.3551	0.3533	**3D 4800K**	X	0.3440	0.3451	0.3533	0.3515
	Y	0.3554	0.3687	0.3760	0.3620		Y	0.3427	0.3554	0.3620	0.3487
1AA 6850K	X	0.3093	0.3068	0.3144	0.3161	**1BB 6850K**	X	0.3028	0.3005	0.3099	0.3115
	Y	0.2993	0.3113	0.3186	0.3059		Y	0.3304	0.3415	0.3509	0.3391
1CC 6250K	X	0.3115	0.3099	0.3196	0.3205	**1DD 6250K**	X	0.3161	0.3144	0.3221	0.3231
	Y	0.3391	0.3509	0.3602	0.3481		Y	0.3059	0.3186	0.3261	0.312
2AA 5800K	X	0.3231	0.3222	0.3290	0.3290	**2BB 5800K**	X	0.3196	0.3290	0.3290	0.3207
	Y	0.3120	0.3243	0.3300	0.3180		Y	0.3602	0.3690	0.3538	0.3462

		Bottom	Left	Top	Right			Bottom	Left	Top	Right
2CC 5400K	X	0.3290	0.3381	0.3376	0.3290	2DD 5400K	X	0.3290	0.3290	0.3366	0.3361
	Y	0.3690	0.3762	0.3616	0.3538		Y	0.3180	0.3300	0.3369	0.3245
3AA 5200K	X	0.3361	0.3366	0.3440	0.3426	3BB 5200K	X	0.3376	0.3381	0.3480	0.3463
	Y	0.3245	0.3369	0.3428	0.3291		Y	0.3616	0.3762	0.3840	0.3687
3CC 4800K	X	0.3463	0.3440	0.3571	0.3551	3DD 4800K	X	0.3426	0.3440	0.3515	0.3495
	Y	0.3687	0.3840	0.3907	0.3760		Y	0.3291	0.3428	0.3487	0.3339

Notes：*Measurement Uncertainty ：±0.01